Third United Nations International Conference on the Peaceful Uses of Atomic Energy

A/CONF.28/A/829
UNITED ARAB REPUBLIC
February 1964
Original: ENGLISH

Confidential until official release during Conference

Abstract

DETERMINATION OF CERTAIN TRACE IMPURITIES IN PURE LEAD AND ALUMINIUM BY NEUTRON ACTIVATION ANALYSIS

H.K. El-Shamy, A.A. Abdel-Rassoul and T.Z. Bishay

The presence of microquantities of certain metallic impurities in lead generally limits its industrial application. Similarly, the presence of a number of foreign elements even as trace impurities in aluminium may also prevent its use as reactor material. The conventional methods of analysis for purity control of both metals are subjected to numerous limitations. Neutron activation analysis, however, has been commonly applied for ultra-micro quantitative determination of various impurities in a number of metals of high purity.

In the present work, a systematic determination of a considerable number of elements present as trace impurities in lead and aluminium samples of differing purity grades is described. A separation scheme based on co-precipitation and ion-exchange techniques is developed. The samples analysed are irradiated in the Inchass 2MW Research Reactor for differing periods with an activation neutron flux of $1.3 \times 10^{13} n/cm^2 s$ together with suitable standards of the elements to be determined. After 7 days' cooling, aliquot portions of the irradiated samples are dissolved in a suitable acid after the addition of representative carriers of the elements to be investigated. Both lead and aluminium are readily separable as chloride in excess HCl. The non-precipitable chlorides in concentrated hydrochloric acid are subsequently allowed to pass through a column of the strongly basic anionite, Dowex-1, and successfully fractionated with differing HCl/HF concentrations. The metals determined are mainly cobalt, iron, tin, zinc, cadmium, and chromium which have been further separated from the corresponding fractions by chemical precipitation. Moreover, the radiochemical purity of the radioactive nuclides concerned was checked before being compared with those induced

in the similarly irradiated respective standards. In this respect, the addition of carriers favours the possible purification of the radionuclides separated rather than their fractionation in carrier-free state.

The method proposed of successive ion-exchange separation and chemical precipitation thus ensures a complete decontamination from foreign activities. The procedures described can be used for routine analysis with good reproducibility.